Lister's Early Scientific Background*

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Lister's Career[2]

For the benefit of the junior students in my audience, I shall begin with a brief summary of Lord Lister's distinguished career, one aspect of which I purpose discussing in particular.

Joseph Lister was born near London on April 5th, 1827. He studied at University College, London, graduating in arts in 1847, and in medicine with honours in 1852. Before graduating he was house-physician and house-surgeon in University College Hospital; and the year after graduation he devoted to some research of which I shall speak later. In the autumn of 1853 he decided to make an extended tour of the medical centres of the continent, preparatory to putting his foot on the bottom rung of the surgical ladder in London.

But there was one surgeon in the British Isles whom he was led to visit before going abroad — the great James Syme, regius professor of clinical surgery in the University of Edinburgh, whose name is still perpetuated in Syme's amputation of the foot. So to Edinburgh Lister went in 1853, intending to stay a month; but so impressed was he by Syme, and Syme by him, that it was decided that he should remain for the winter, Syme arranging clinical opportunities for him in the infirmary. In January, 1854, the position of house-surgeon to Syme fell vacant, and Lister was appointed.

About this time something else happened to Lister— he fell in love with Syme's daughter. Small wonder that, with life beckoning him to Edinburgh, he decided to abandon his continental tour and his London career, and settle in "the modern Athens." In 1855 he commenced private surgical practice, and began to lecture on surgery; he also pursued important researches, to be mentioned later. The following year he was appointed assistant surgeon to the Royal Infirmary, and he married Agnes Syme.

The next three years so enhanced Lister's reputation that in 1860 he was appointed regius professor of systematic surgery in the University of Glasgow—at the age of thirty-three. His nine years in Glasgow formed the most outstanding period of his career, the period that witnessed the development of the antiseptic principle in surgery. In 1869 Lister succeeded Syme as regius professor of clinical surgery in the University of Edinburgh. The eight years of Lister's second Edinburgh period saw him at his best, and witnessed the establishment of the antiseptic principle.

In 1877, when 50 years of age, Lister returned to London as professor of clinical surgery at King's College; his fifteen years there were Lister's least spectacular working period, though his activity continued. He retired from his professorship in 1892, on reaching the age of 65, and from the hospital in the following year, which also saw the death of his wife. He now gradually withdrew from practice, though retaining certain scientific interests for several years; he passed into more and more complete retirement, and eventually into feebleness; and he died at Walmer, Kent, in 1912, in his 85th year.

This remarkable career comprises five distinct periods: the first London period of preliminary education, training and research; the first Edinburgh period, of surgical development and further research; the Glasgow period, of antiseptic beginnings; the second Edinburgh period, of antiseptic ascendancy and bacteriological research; and the second London period, of final antiseptic vindication and the homage of the civilized world.

Lister's great fame rests not upon the invention of a new surgical technique (he was not the first to apply antiseptic chemicals to wounds), but upon the discovery and proof of the great scientific principle that inflammation and putrefaction in wounds are associated with the presence of pathogenic microörganisms, with its practical corollary that inflammation and putrefaction may be prevented, and healing promoted, by keeping wounds free of such organisms. Lister's methods of doing this have, of course, been superseded, but his principle continues to dominate surgical technique.

I shall now offer some remarks about several of the men who influenced Lister in a scientific way, and some comments upon his own pre-antiseptic researches.

Lister's Father

Of those who contributed toward Lister's scientific outlook, pride of place belongs to his father, Joseph Jackson Lister (1786-1869), a prosperous wine-merchant by trade, but an amateur microscopist of such distinction as to be elected a Fellow of the Royal Society of London. Lister has given us an interesting account of his father's "labours in the improvement of the achromatic microscope." While still a child, the father discovered that on looking with his short-sighted eye through air-bubbles in the window-pane he could see distant objects more clearly than through unblemished glass. This was the beginning of a life-long interest in optics, including the microscope. (It was Lister's father who invented the tripod for supporting cameras). The achromatic lenses of that time presented certain optical properties that nullified attempts at high magnification. The outcome of a long series of careful observations and experiments was a paper *On the Improvement of Compound Microscopes* read before the Royal Society in 1830, describing "those combinations of achromatic lenses into one objective, which form the basis of the construction of the modern microscope" (Schafer). By this work Lister's father rendered possible every observation made since 1830 involving the use of high powers of the microscope. It is an interesting fact that in 1827 he collaborated with his nephew, Dr. Thomas Hodgkin (of Hodgkin's disease) in an important study of red blood cells, in which rouleau formation was described for the first time. The influence of such a father needs no emphasizing.

Thomas Graham

An Englishman, educated in London, it might be thought that Lister would take with him to Edinburgh a purely English scientific training. Not at all. Apart from his father, Lister was mainly influenced by three of his teachers at

* Lister Day Address, University of Manitoba Medical College, Winnipeg, April 5th, 1940.

University College: Thomas Graham, professor of chemistry; William Sharpey, professor of anatomy and physiology; and Thomas Wharton Jones, professor of ophthalmic medicine and surgery. All three were Scotsmen. Graham was a Glasgow graduate, but had studied in Edinburgh; Sharpey and Jones were originally Edinburgh anatomists. Thus, during his professorships at Glasgow, Edinburgh and London, Lister may be said to have returned handsomely the benefits he had received from these sources of intellectual stimulation.

Thomas Graham (1805-1869), a brilliant chemist, took a friendly interest in Lister, and his influence is directly recognisable in some of Lister's work. Graham is most famous for his studies of the laws governing the diffusion of gases and liquids, his investigation of osmosis, and his recognition of the distinction between crystalloids and colloids. Lister's consideration of the effects of cotton wool dressings upon the escape of volatile antiseptics from wounds, and on the permeation of the air to wounds, was based on what he termed "Graham's beautiful researches into the laws of gaseous diffusion." And in his important work on the coagulation of the blood Lister utilised his knowledge of Graham's researches on the diffusion of liquids and on the properties characteristic of colloids. In his numerous experiments on antiseptics and dressings the influence of Graham's teaching on solubilities and other chemical properties is evident.

Wharton Jones

I have long been interested in Thomas Wharton Jones (1808-1891), doubtless partly because he was a pupil of my old school near Edinburgh. Trained in medicine at Edinburgh in the early years of the last century, he became assistant to Dr. Knox, the brilliant anatomist at Surgeons' Hall; later he taught physiology at the Charing Cross Hospital Medical School in London; and about the middle of the century he became professor of ophthalmic medicine and surgery at University College, in which capacity he taught Lister. Indeed, Lister was his assistant for a brief period; but what was important to Lister was not Wharton Jones' ophthalmology, but his brilliant microscopic investigations on the blood vessels and inflammation. I should like to speak of Jones in a little detail. Without doubt, he was what is sometimes called "a character." He remained unmarried, and was described (by a Londoner[2]) as having peculiar manners and an outrageously Scotch accent! In his later years he became practically a recluse; in the severe winter of 1881 he fell ill, and one of his old pupils discovered him in an extremity of destitution and suffering. Some of his pupils and friends forthwith contributed a sum of money which was quietly credited to his bank account; the discovery of this balance caused the greatest surprise to the old gentleman, who never understood how it got there!

Wharton Jones could scarcely have had two more illustrious pupils than Professor Huxley and Lord Lister. Such of you as happen to remembe that one of the cell layers of the sheath of th root of a hair is called Huxley's layer, may b interested to know that that was Huxley's firs piece of research, done while a student of Wharto Jones and under his guidance; Wharton Jone thus has the honor of having started Huxley o his great scientific career. I am going to le Huxley tell you, in his own words, of an unfort unate aspect of Wharton Jones' career which ma not be overlooked, and which helps to explai why we are not more familiar with him and hi work. "Not infrequently I was invited to take te in George Street, and used to listen with great interest to Wharton Jones' talk about this or that scientific question of the day, or about the work on the blood corpuscles in which he was then engaged; and, not rarely, about his griefs against various persons of eminence in the scientific world of the time by whom he considered himself to have been ill-treated, and whose conduct he resented with no little vehemence. I am deliberately of opinion that my old master had great ground for complaint; he had seen work which he knew to be worthless, and which all the world now knows to be so, preferred and rewarded in the teeth of his remonstrances, with the effect of discrediting his own valuable labors. Injustice of this kind is hard to bear, and Mr. Jones protested against it with more energy than worldly wisdom perhaps. It grievously embittered his life and, I suspect, interfered with his success."[3] Upon learning of Jones' financial distress, Huxley exerted his influence to obtain from the Gladstone government a pension which helped Jones to pass his last years in comparative comfort on the Isle of Wight.

No attempt can be made here to summarize, or even to mention, Wharton Jones' numerous publications, ranging, as they did, from evolution to Home Rule for Ireland, both of which he opposed! His fame as an investigator rests on a series of researches of outstanding brilliance in their day, which may be subsumed under the headings (1) embryology, (2) ophthalmology, (3) haematology, (4) angiology, (5) pathology.

The mammalian ovum was discovered by von Baer in 1827. Wharton Jones discovered its nucleus in 1835; he did not know that Coste of Paris had seen it the year before. In 1837 he described one of the youngest human zygotes known at that time, and for many a year thereafter. In 1844 he made an important contribution to our knowledge of the development and histology of the corpus luteum, discussing the difference between so-called "true" and "false" corpora, and their relationship to menstruation and coitus.

Wharton Jones was the first to describe the pigmented epithelium of the choroid coat of the eyeball; he also showed that it does not always contain pigment (e.g. in albinos). His most brilliant contribution to ophthalmology was his demonstration that astigmatism depends not on some fault in the lens, as the discoverer of the condition, the great Thomas Young, had thought, but upon abnormal curvature of the cornea. Interesting in connection with his work on stereoscopic vision, and other branches of visual physiology, is the opinion of one ophthalmologist (Ball, of St. Louis[1])

that Wharton Jones just missed inventing the ophthalmoscope; I have not been able to check this.

Amoeboid movements were seen in *Amoeba* by Rosenhof as early as 1755, but not until 1846—not quite a century ago—were they described in any of the cells of higher animals; Wharton Jones observed them in the colorless blood cells, or, as he called them, "granule-cells;" incidentally, this was the beginning of the recognition of what we call the granular and non-granular series of leucocytes. This is the discovery for which Wharton Jones is most famous. These amoeboid movements are the foundation of the diapedesis of leucocytes through the walls of the capillaries, studied by Cohnheim and others; we may imagine the satisfaction with which those who disliked Jones cited, as exemplifying his peculiar obstinacy, the fact that throughout the rest of his long life he, the discoverer of the amoeboid movements of leucocytes, resolutely denied the occurrence of diapedesis! Wharton Jones wrestled, as well as he could with the technical facilities then available, with the difficult problems, many of them still unsolved, concerning the developmental relationships between the various cells of blood and lymph; he made notable contributions to comparative haematology.

Wharton Jones was specially proud of a discovery that he made in 1852, namely, in the words of the title of his paper, the "discovery that the veins of the bat's wing (which are furnished with valves) are endowed with rhythmical contractility, and that the onward flow of blood is accelerated with each contraction." I cannot stop to advert to the significance of this in connection with our ideas on the forces determining the venous circulation, but shall return to it when speaking of some work of Lister's. Wharton Jones made many other first rate observations on the anatomy and physiology of the circulatory system, but time does not permit mention of them here.

At least as early as 1842 Wharton Jones had written on inflammation; in 1850 he published a classical essay, elucidating that subject by means of injections, experiments, and microscopic observations on the web of the frog's foot. His interest in this subject continued throughout life: in the year of his death (1891) he published a "Report on the State of the Blood and the Blood Vessels in Inflammation."[3] I found this fascinating reading, but have no time to discuss it (even were I qualified to do so), beyond pointing out that all Jones' work on inflammation was a natural extension of his studies on the anatomy and physiology of the blood and vessels; it was this feature that proved so helpful to Lister.

William Sharpey

It is time, however, to turn to Lister's other teacher, William Sharpey (1802-1880). A few years older than Jones, Sharpey also received his medical training in Edinburgh. Having travelled (largely on foot) and studied extensively on the continent, Sharpey became an extra-mural teacher of anatomy in Edinburgh, from 1829 to 1836. He had met Syme in Paris, and a life-long friendship ensued. Prior to 1836 there was neither man nor laboratory in the British Isles wholly devoted to physiology. In 1836 Jones Quain retired from the chair of anatomy and physiology at the institution now called University College, London, and the college authorities decided that the time had come to create a full-time professorship in each subject. Sharpey was selected for the professorship of physiology. But he was an anatomist, and keenly alive to the importance of that new anatomical world being revealed by the achromatic microscope then recently improved by Lister's father. Sharpey therefore based his physiology mainly upon microscopic anatomy; indeed, his professorship was entitled anatomy and physiology, the anatomy being specified as general (or physiological), microscopical and visceral anatomy, whereas the ordinary professorship of anatomy, to which Jones Quain's brother, Richard Quain, was appointed, was designated as dealing with descriptive and practical anatomy. This move determined the characteristics of British anatomy and physiology until comparatively recent times. Sharpey retained his chair until 1874, and died in 1880. Like Wharton Jones, he remained unmarried.

Unlike Wharton Jones, however, Sharpey made very few independent publications; most of his researches, which were made with the microscope, were published in the fifth to the eighth editions of Quain's Anatomy (of which he was one of the editors), and in similar publications. While in Edinburgh, during the 1830's, Sharpey made his reputation by pioneer investigations on cilia, ciliary motion, and the currents produced thereby. It is interesting to note that not until 1834 (i.e., after J. J. Lister's improvement of the achromatic microscope) was the existence of cilia in vertebrates discovered (by Purkinje and Valentin). Sharpey studied the effects on ciliary action of lack of oxygen, narcotics, and other factors; he also demonstrated the important ciliary currents in the nasal cavities and sinuses.

Sharpey is best known for his researches on the microscopic anatomy and development of bone. He discovered the decussating fibres of bone lamellae, and described the perforating fibres to which his name was attached by Kölliker; he described somewhat comparable lamination and fibrillation in decalcified dentine. In addition to working out many of the details of ossification, Sharpey made the fundamental distinction between ossification involving cartilage, and that without cartilage, together with the important comparison between membranous ossification and the subperiosteal ossification of cartilage bones.

Sharpey discovered the glands of the uterus; and showed that the decidua, previously regarded as an exudation from the endometrium, is in reality the thickened and altered endometrium itself. He also clarified the process of embedding of the zygote into the decidua.

Sharpey is important historically not so much because of his researches as by reason of his teaching, and his remarkable influence upon physiology (and, indirectly, anatomy). This influence was transmitted through three distinguished pupils and assistants, each of whom founded a British school of physiology. These were: Sir Michael Foster, who founded the Cambridge school of physiology; Sir John Burdon-Sanderson, who founded the Oxford school of physiology; and Sir Edward Sharpey-Schafer, who founded the modern Edinburgh school of physiology. Most modern British physiology (and histology) can be traced through these three back to Sharpey. Schäfer named one of his sons Sharpey, and when that son lost his life in the last war, Schäfer commemorated both his son and his old teacher by incorporating the name Sharpey into his own, calling himself Sharpey-Schafer (at the same time dropping the umlaut from Schäfer). A fourth distinguished pupil of Sharpey, Newell Martin, accompanied Foster to Cambridge in 1870, then migrated six years later to a professorship in the newly-founded Johns Hopkins University at Baltimore, whence, by his leadership in American physiology and biology for nearly twenty years, he diffused Sharpey's influence widely over this continent.

Lister's Pre-antiseptic Researches[4]

But Sharpey had yet another outstanding pupil: Lister. Lister himself wrote, many years later: "As a student at University College I was greatly attracted by Dr. Sharpey's lectures, which inspired me with a love of physiology that has never left me. My father, whose labours had raised the compound microscope from little better than a scientific toy to the powerful engine for investigation which it then already was, had equipped me with a first-rate instrument of that kind, and I employed it with keen interest in verifying the details of histology brought before us by our great master."

In 1847 von Kölliker announced the cellular constitution of smooth muscle (although, as Lister pointed out in his first paper, the cells are clearly depicted in some unpublished drawings made by Wharton Jones in 1843, and the principle was taught by Jones at the Charing Cross Hospital; still, Kölliker had priority of publication). There was neither mechanical section-cutting nor staining in those days, and technical difficulties left in doubt the state of affairs in the iris. In the summer that Lister graduated (1852) Wharton Jones had occasion, during an ophthalmological operation, to remove a piece of iris, which he gave to Lister, who reinforced his observations on it with the study (under Sharpey's guidance) of a number of other human and animal irises, the outcome of which was to settle, by observation, two points previously doubtful, namely, (1) the existence of smooth muscle in the iris, and (2) its arrangement into definite constrictor and dilator pupillae muscles. This, Lister's first paper, and a brilliant one, was published in 1853, the year after he graduated. Well might the late Dr. D. A. Stewart of Ninette declare, in his charming Lister Day Address delivered in this theatre in 1931, that "Lister was a wonderful starter, off at the drop of the hat." T same year he published a less important pap confirming and amplifying Kölliker's observatio on the *arrector pili* muscles. During this ye (1853) he also performed some experiments absorption and flow in the lacteals, which he d not publish until four years later.

While he was house-surgeon in University C lege Hospital, Lister had to handle an outbre of "hospital gangrene," by the awfulness of whi he was deeply impressed, and the material fro which he examined under his microscope in t hope of getting some clue as to the nature a cause of the condition. From this experience read two papers before the hospital medi society, one on "Gangrene," the other on the "U of the Microscope in Medicine." These were n published, and were probably intrinsically u important; but their titles show that his min had already "hit the trail" that was to lead his great work: he had become interested in i flammation. The following passage from Wharto Jones' "Report on the State of the Blood a Blood Vessels in Inflammation" speaks for itse

"Lister had been a pupil of my class in Universi College, and had served temporarily as my ophthalmi assistant at the hospital, having, at his own reques obtained permission from me to do so. That Sir Josep had been studying my papers on Inflammation wit great diligence was evident from the pertinence o his inquiries in conversation with me respecting m observations, in order to obtain by word of mout further elucidations of the subject. So intent, indee was he in his inquiries that he, one day, accompanie me in my walk to the Regent's Park after the hospit visit, *cross-examining* me all the way" (italics in th original[3]). Throughout Lister's writings on in flammation, his indebtedness to Wharton Jones i manifest.

In the autumn of 1853 Lister went to visit Sym in Edinburgh, on the recommendation of Graha and Sharpey, and bearing a letter of introductio from the latter, who, as already mentioned, wa an intimate friend of Syme's. Throughout hi first Edinburgh period, Lister occupied all hi spare time with a remarkable series of fruitfu investigations, in which he was greatly encourage and assisted by his wife, the experiments bein performed mostly in the back kitchen. A lette from Mrs. Lister, written during the Glasgow per iod, has this revealing statement: "Another cal was brought in on Saturday, but Joseph could no be ready to make use of it that day, so we kept i in the wash-house till Tuesday evening. Then good many experiments were made!"[2] These in vestigations, especially the early ones, were insti gated partly by Lister's desire to be in a positio to lecture authoritatively on inflammation in hi course on surgery.

In 1858 he published a classical paper "On th Early Stages of Inflammation," which I shall no attempt to discuss, beyond remarking how clearl the influence of Wharton Jones' work is discern ible throughout, even the objects experimented on

being similar, namely, the frog's foot and the bat's wing. Lister followed Wharton Jones in seeking an explanation of inflammatory phenomena in the underlying anatomy and physiology, and I should like to mention some of his work in these fields.

Ordinarily, inflammation is characterised by vaso-dilation, the mechanism of which involves the structure of arterioles. Although implications concerning change in calibre of peripheral vessels may be detected in some of Harvey's statements, John Hunter (1728-1793) was the first to demonstrate arterial contractility, and to distinguish it from elasticity; contractility implied muscularity; this was demonstrated by Henle in 1840, but not until Kölliker's work of 1846 was the nature of this musculature made clear. Following Lister's papers on the iris and the skin, however, Kölliker's view was challenged, notably by Lister's professor of anatomy, G. V. Ellis, who had succeeeded Richard Quain at University College. In a brilliant paper read before the Royal Society of Edinburgh, Lister not only re-confirmed the cellular nature of smooth muscle in blood vessels and in the intestine, but he demonstrated for the first time the contractile myofibrils within the cells, and the difference between the appearance of smooth muscle in the contracted and in the relaxed state; furthermore, he showed that in the smallest arterioles (the calibre of which he discovered to be sometimes less than that of the average capillary) the smooth muscle cells are reduced to a single layer, and are wound *spirally* round the vessel. The widespread neglect of these early researches of Lister is well exemplified in a letter written as late as 1895 by Professor T. W. Engelmann of Utrecht to Lister, who was then retired, but apparently had recently sent Engelmann a copy of this old paper. Engelmann wrote in part:

"I am ashamed I did not know your masterly researches from 1857 when I wrote my paper on the fibrillar structure of contractile substances in 1881. But even Kölliker does not mention them in his 'Gewebelehre!' You are evidently the first who observed clearly the longitudinal fibrils of the non-striped muscle-cells, and you are also the first and till now even the only observer who studied, measured and pictured the different forms of these cells in different phases of contraction. In all the treatises on histology, I know, only relaxed or extended cells are presented and described . . . When I get time I hope to repeat your observations and to study the microscopical changes in non-striated cells during contraction with the new microchemical and optical methods. But I fear I shall not come much further than you have already been nearly forty years ago!!"[2]

On the basis of observations on the frog's foot, Lister concluded that capillaries are quite devoid of contractility (though manifesting elasticity)—a matter that could scarcely be disposed of so easily today. Lister made a few observations on contraction of veins, in connection with which he mentions "the remarkable rhythmic variations in calibre discovered by Mr. Wharton Jones in those of the bat's wing." As an example of the heartiness and all-roundedness of Wharton Jones' criticism of his contemporaries, I should like to quote the following few sentences referring to this matter.

"The title of my paper in the 'Philosophical Transactions' for 1852 is this: 'Discovery that the veins of the bat's wing, which are furnished with valves, are endowed with rhythmical contractility, and that the onward flow of blood is accelerated at each contraction.' The title, though brief, indicates something more than rhythmical variations in calibre, but Sir Joseph does not quote it, so that all his remarks on the subject are meaningless or short of the truth. Nay, worse than this, Lister does not notice the fact, especially insisted on in a postscript to my paper, that, in the ear of the long-eared bat, which admits of being displayed for examination under the microscope, the veins are found not to be endowed with rhythmic contractility like those of the wing . . . The expression 'rhythmic variations in calibre' (physiologically illiterate as it is), without any reference to the effect on the flow of blood in the vessels, to designate the rhythmical heart-like action of the walls of the veins of the bat's wing with corresponding constrictions of their calibre has been adopted by Professor Michael Foster of Cambridge (an old pupil of Dr. Sharpey, like Sir Joseph Lister), and persisted in. This blundering, both by commission and omission, on the part of Foster, is very little less excusable than the unfounded utterance of Professor Burdon Sanderson, the Oxford Professor of Biology, that 'rhythmical contractions of veins occur in certain animals,' or that meaningless assertion of Professor McKendrick, the Glasgow professor, viz., that rhythmical contractions of veins 'sometimes' takes place."[3]

And so on, in like vein! Jones pays his respects to Sharpey (with whom he had a long-standing feud) thus: "The microscopical characters of the rhythmically contractile muscular fibres of the walls of the veins of the bat's wing are pictorially delineated in my paper in the 'Philosophical Transactions.' This notwithstanding, and notwithstanding the special description I gave of them as altogether unique, the late Professor Sharpey, who, as Secretary communicated Lister's paper, under notice, to the Royal Society, had in an histological notation to a Students' Manual of Anatomy (the edition which appeared several years subsequently to the publication of my paper), alleged that the rhythmically contractile muscular fibres of the walls of the veins of the bat's wing do not differ in their microscopical characters from the ordinary plane muscular fibres of veins in other parts of the bat's body—a blunder regarding which I questioned Dr. Sharpey one evening at the Royal Society. His reply was that I had told him so, which I certainly never did. I remember quite well telling him the very opposite fact which I had specially stated in the P.S. to my paper in the 'Philosophical Transactions,' some years previously."[3]

Lister made numerous observations upon vasomotor phenomena in arterioles, and the effects of these on the circulation. Shortly before, Claude Bernard and Brown-Séquard had directed attention to the vasomotor action of certain peripheral nerves, especially the cervical sympathetic and the chorda tympani, and Wharton Jones and others had experimented on vasomotor control through spinal nerves. Along with Waller and Budge, Brown-Séquard, Moritz Schiff, and Pflüger, Lister ranks as a pioneer in the experimental study of the control of vasomotor phenomena by the *central* nervous system. He also performed some notable experiments on the "Effects of the Position of a Part on the Circulation through it;" this work, on postural vasomotor reflexes, seems to have been largely forgotten; it may be of considerable importance in connection with some of the physiological difficulties associated with aviation. He also studied the reflex basis of counter-irritation. Such work developed an interest in other aspects

of what we now call the autonomic system, including its control over viscera generally, and over the pigment cells in the frog's skin. He drew attention to the usefulness of the pigment cells as criteria of nervous control, and of pathological and toxicological phenomena; only within very recent years has this lead been followed up, notably by G. H. Parker, of Harvard. Weber having shown in 1845 that stimulation of the vagus arrests the heart, and Pflüger having found in 1857 that stimulation of the splanchnic nerves diminishes intestinal peristalsis, the question of inhibition was then much discussed. Lister disliked Pflüger's idea of special inhibitory fibres, and experimented on the heart and on the intestines to disprove it; but his usual caution was not sufficiently in evidence in so difficult a matter, and we can now see where he erred in interpreting his experimental results.

In 1859 Lister collaborated with William Turner, then senior demonstrator of anatomy in the University of Edinburgh,* in an investigation into the structure of medullated nerve fibres; they utilised the then new techniques of fixing and hardening in chromic acid, and staining with carmine, to elucidate some points of chemical and anatomical distinction between the axis cylinder and the medullary sheath.

The vascular changes in inflammation aroused Lister's keen interest in the properties of blood cells, in the phenomena of coagulation, both intra-vascular and extra-vascular, and in the vitality of tissues labouring under an impaired blood supply. These investigations, numerous, painstaking, often brilliant, extended throughout Lister's working career. I can mention only a few points here. Lister gave considerable attention to the adhesiveness of blood cells. He proved that normal blood does not clot within a vessel unless either the vessel wall is damaged (by disease or injury), or foreign material is introduced. He also showed that the atmosphere does not make blood clot; that normal intra-vascular blood has no spontaneous tendency to clot; and that normal endothelium neither causes nor prevents clotting. Lister disproved Wharton Jones' view that the capillary congestion in inflammation is caused by contraction of the arterioles. He gave particular attention to the rôle of the vasomotor system in inflammation; and his studies of the action of irritants upon the circulation and the tissues were very thorough. His use of ciliated epithelium as a sensitive indicator of noxious influences was based directly on Sharpey's work. (The influence of Sharpey's researches on ossification is seen in Lister's microscopic study and explanation of an exostosis removed by Syme shortly after Lister's arrival in Edinburgh).

The Full Corn in the Ear

We must now hurry along to the flourishing city of Glasgow, on a memorable day in the year 1865, when the professor of surgery (Lister—aged 38) and the professor of chemistry (Thomas Anderson —blessed be his name) were discussing their interests; Anderson showed Lister some recent papers by a French chemist named Louis Pasteur. Upon reading some of Pasteur's researches dealing with the rôle of certain microscopic organisms in the processes of fermentation and putrefaction, Lister conceived the brilliant idea that possibly here was the cause of inflammation and putrefaction in wounds that he had been seeking so ardently, and that if wounds could be kept free of such organisms, they would escape inflammation, and heal readily. He put his idea to the test of practical application, and it worked sufficiently well to show that he was on the right track. The rest of his professional life was devoted mainly to supporting the validity of the antiseptic principle by a great deal of careful bacteriological research, and to improving the clinical methods of applying his scientific principle.

Retrospect

Ladies and gentlemen, my tale is told; its title is "Lister's Early Scientific Background." The essentials of that background, as I have tried to show you, were: (1) the scientific influence of his father; (2) the influence of the teaching and early training in research that Sharpey gave him; (3) the effect of his hospital experience in defining his great problem—in firing his desire to find the cause and the control of suppuration and putrefaction in wounds (i.e., his interest in inflammation); (4) the influence of Wharton Jones' researches on inflammation in directing Lister's own; (5) the influence on Lister's mind of his researches on inflammation, and on the anatomy and physiology of the blood and vessels. All this experience developed the kind of trained intellect that was able and ready to take the crucial step of perceiving the relationship between Pasteur's work and his own. John Hunter might have made the Listerian discovery, but he lived a century too soon—he died in 1793, while Lister's father was still looking through the bubbles in the window-pane, and before either Wharton Jones or Pasteur had seen the light of day. As the opposition to Lister made painfully clear, scarcely another surgeon of his time had his scientific background; well might the sagacious Sir Clifford Allbutt declare, in his oft-quoted words, that "though Lister saw the vast importance of the discoveries of Pasteur, he saw it because he was watching on the heights; and he was watching there alone."

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(4) Lister, J. The Collected Papers of Joseph Baron Lister. Oxford, Clarendon Press. 1909. 2 vols.
(5) (Obituary). Thomas Wharton Jones. Brit. Med. Jour., Nov. 28, 1891, p. 1175.

* Turner later became professor of anatomy for many years; he was principal of the university at the beginning of my student days; he was succeeded as professor of anatomy by D. J. Cunningham, the original author of a well-known "Manual of Practical Anatomy."

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Special Articles and Association Notes

The Manitoba Medical Review

ESTABLISHED 1921

WINNIPEG, MAY, 1940

Published Monthly by the
MANITOBA MEDICAL ASSOCIATION
Canadian Medical Association, Manitoba Division
Editorial Office
102 MEDICAL ARTS BUILDING, WINNIPEG

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Annual Subscription - $2.00

Editorial or other opinion expressed in this Review is not necessarily sanctioned by the Manitoba Medical Association

Executive Meeting

Minutes of a meeting of the Executive Committee of the Manitoba Medical Association held in the Medical Arts Club on Wednesday, March 27, 1940, at 6.30 p.m.

Present.

Dr. W. E. Campbell (Chairman)
Dr. E. L. Ross
Dr. W. S. Peters
Dr. E. J. Skafel
Dr. W. F. O'Neill
Dr. A. M. Goodwin
Dr. O. C. Trainor
Dr. C. W. MacCharles
Dr. E. S. Moorhead (Chairman, Committee on Economics)
Dr. M. S. Lougheed (Medical Health Officer).

Minutes of the last Executive meeting held on Wednesday, January 31st, were summarized by the Secretary.

It was moved by Dr. O. C. Trainor, seconded by Dr. E. J. Skafel: THAT the minutes be adopted. —Carried.

Business Arising Out of the Minutes

Report on Medical Service Scheme (Firefighters' Club).

Dr. Moorhead reviewed the progress of the discussions since the last meeting of the Executive Committee, and reported that this scheme had been presented to a meeting of the Winnipeg Medical Society and they had agreed to adopt the plan for one year as an experiment.

It was moved by Dr. E. J. Skafel, seconded by Dr. W. S. Peters: THAT the details of appointments necessary with regard to this scheme, be left to the Winnipeg Members of the Executive. —Carried.

Municipal Doctors.

The secretary reported that as instructed at the last Executive meeting he had written to the Deputy Minister of Health, Dr. Jackson, and asked for a copy of the regulations governing the appointment of Municipal Doctors.

Dr. Jackson had sent a copy of the relevant parts of the Municipal Act, and also a copy of the form of agreement used in these cases.

It was pointed out that it would be impossible to discuss this information without the members of the Executive having an opportunity to study the details.

It was moved by Dr. E. L. Ross, seconded by Dr. W. F. O'Neill: THAT copies of this report from Dr. Jackson be mimeographed and sent to all the members of the Executive, and

THAT Dr. Jackson be asked for the number of Municipal Physicians in Manitoba, salaries paid, the areas involved, population, mileage covered and the amounts paid for mileage, and that this information be mimeographed and sent to the members of the Executive Committee, and

THAT the question be discussed at the next Executive meeting. —Carried.

Report from Legislative Committee on Resolution from Surgeons Club re Underwriters' Association.

The secretary read a report from Dr. G. S. Fahrni, Chairman of the Legislative Committee, under date of February 28th, with regard to resolution from the Surgeons Club re the Underwriters' Association.

It was moved by Dr. W. S. Peters, seconded by Dr. E. L. Ross: THAT a copy of this report be sent to the Surgeons Club, and that a suitable notice be prepared advising the profession that any misunderstandings with regard to insurance claims may be referred to the Legislative Committee. —Carried.

Legal Status of Internes.

The secretary reported that he had received a memorandum from Dr. Harvey Agnew, Secretary of Department of Hospital Service, Canadian Medical Association, incorporating a legal opinion of Mr. Newcombe, which had been sent to the Canadian Medical Protective Association. This memorandum was read by the secretary.

It was moved by Dr. E. L. Ross, seconded by Dr. W. S. Peters: THAT a copy of the report be sent to the Secretary of the Honorary Attending Staff of St. Boniface Hospital, and that it be read at the Annual General Meeting of the Manitoba Medical Association. —Carried.

Report from Deputy Minister of Health re Examination of People Attending Youth Training Centres.

The secretary reported that he had received a letter from Dr. Jackson, Deputy Minister of Health, under date of February 22nd, 1940, explaining the situation with regard to the examination of those attending the Youth Training Centres, and also memorandum drawn up by Dr. Sheps, who is in charge of this work. Dr. Jackson's letter was read by the secretary.

Dr. Skafel reported that he had sent to the Deputy Minister of Health a bill for $6.00 for reading tuberculin reactions done on those attending Youth Training Centres in his district. This had evidently been referred to Dr. Sheps, who had written to Dr. Skafel objecting that he should be willing to do this work gratis, in order to further the efforts of the Department of Health, and the bill had not been paid.

It was moved by Dr. O. C. Trainor, seconded by Dr. W. F. O'Neill: THAT Dr. Skafel forward the relevant correspondence to the secretary of the Manitoba Medical Association, and that the secretary be instructed to write to Dr. Jackson with regard to this problem after the correspondence has been received. —Carried.

Report of Special Committee Appointed to Meet with Representatives of the Manitoba Hospital Association to Discuss the Inadequacy of Hospital Costs.

Dr. Campbell reported on the two meetings held on the 15th and 18th of March. A copy of the minutes of these meetings are on file with a letter from Mr. Gagnon, Secretary of the Manitoba Hospital Association.

Dr. Campbell explained that it would evidently be necessary to arrange to send speakers to the District Meetings of the Union of Municipalities, in order to make clear to them the difficulties of the hospitals with regard to payment for public ward patients.

Proposed Study of Antenatal, Natal and Neonatal Deaths and Still Births.

The secretary read two letters from Dr. Jackson, Deputy Minister of Health, under date of February 13th and February 20th, respectively, advising that the Department intended to carry on this survey.

New Business

Instructions to Member on Canadian Medical Association Executive.

Dr. Trainor discussed the agenda for the meeting of the Executive Committee of the Canadian Medical Association, April 8th and 9th. Particular attention was paid to the following items:

Annual Meeting: Dr. Trainor reported that he would be expected to discuss the feasibility of holding the Canadian Medical Annual Meeting in Winnipeg in 1941. After considerable discussion it was finally agreed that Dr. Trainor should state that the Manitoba Medical Association were willing to make the necessary arrangements if it was thought that the meeting could be made a success.

Dr. Peters pointed out that Dr. Clingan of Virden would be eligible for senior membership.

The secretary was instructed to write to the Secretary of the Canadian Medical Association submitting Dr. Clingan's name.

Correspondence

Radio Programmes.

The secretary read a letter received from Dr. Routley under date of January 15th, 1940, asking if any of the members in Manitoba would be willing to prepare talks for the radio.

The secretary reported that a copy of this letter had been sent to the Winnipeg Medical Society.

It was suggested that a copy of the letter should also be sent to the Brandon District Medical Society.

Several members from the country reported that they listened to the radio programmes, and found them very interesting.

Resignation of Secretary.

The President read a letter from the secretary under date of March 26th, advising that he had been called up for Naval service as from April 5th, and he wished to submit his resignation.

It was moved by Dr. W. S. Peters, seconded by Dr. E. L. Ross: THAT the resignation of the secretary be not accepted, and that he be granted leave of absence for the duration of his war service. —Carried.

Resignation of Editor.

The President read a letter from the secretary under date of March 26th, tendering his resignation as Editor of the "Manitoba Medical Review" as well.

It was moved by Dr. W. S. Peters, seconded by Dr. E. L. Ross: THAT Dr. MacCharles' resignation be accepted with regret. —Carried.

Medical Relief Scheme.

Dr. Lougheed, Medical Health Officer of the City of Winnipeg, was present and read his letter addressed to the Secretary of the Manitoba Medical Association, and explained it in detail.

Dr. Skafel asked if the City paid for medical care of people on old age pensions.

Dr. Lougheed stated that this care was paid for to the extent that if the Department were asked a district physician would be sent to see the patient.

In discussion Dr. Lougheed's proposals, Dr. Trainor objected that the proposed scheme would only give a definite sum of money to cover an unlimited amount of illness, and in this way the medical profession would be underwriting all the risk.

Dr. Peters pointed out that the Provincial Government would pay for medical services to old age pensioners if they came from unorganized territory, but not if they came from organized territory.

The Chairman discussed in some detail with Dr. Lougheed the various paragraphs of his letter.

After a general discussion, it was moved by Dr. O. C. Trainor, seconded by Dr. E. J. Skafel: THAT this letter be referred to the Committee on Economcis. —Carried.

The meeting then adjourned.

Attention

The Legislative Committee of the Manitoba Medical Association would like to call attention to the paragraph in the minutes in regard to the relationship between practising physicians and surgeons and the insurance companies.

Please send any complaints to the Secretarial Office of the Manitoba Medical Association, 102 Medical Arts Building, for reference to the Legislative Committee.

G. S. FAHRNI,
Chairman, Legislative Committee.

OBITUARY

Dr. Frank Andrew Smith died at St. Joseph's Hospital, Winnipeg, on April 11th, aged 57. For three years he had been in poor health.

Born at Whitemouth, Manitoba, he was educated in Winnipeg schools, St. John's College and Manitoba Medical College, from which he graduated in 1906. He practiced at Maple Creek, Sask. Birtle, Man., where he opened a private hospital which later became the municipal hospital, and Winnipeg. Before beginning work in Winnipeg he took special training in X-ray at Chicago and in radium therapy at New York.

He was a member of the staff of the Winnipeg General Hospital for some years and a member of the faculty of Manitoba Medical College. At the time of his death he was a staff member of the Children's Hospital, the Municipal Hospitals, the St. Joseph's Hospital and the Mount Carmel Clinic For four years he was a member of the Winnipeg School Board. One of his hobbies was the keeping of bees, and he was a past president of the Manitoba Beekeepers' Association. He was one of the pioneers in radium therapy in Winnipeg.

Affable in disposition, he had many friends both within and without the medical profession.

Department of Health and Public Welfare

NEWS ITEMS

The following is an article appearing in a recent issue of "Preventive Medicine" and written by Frederic W. Bancroft, Associate Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University, New York City.

PREVENTIVE ASPECTS OF CANCER

"In scientific preventive medicine it is essential to have a clear concept of the etiology as well as the pathology of any given disease. Preventive medicine is most effective where we know the organism or virus or lack of vitamin that is responsible for the disease. Unfortunately we do not know as yet what produces cancer. We know from clinical observation and experimental research that chronic irritation or infection may act as the exciting cause: therefore our axioms for prevention of cancer are largely gleaned from clinical observation.

"Before discussing the early diagnosis of cancer and the eradication of precancerous lesions it would seem advisable to review some of the latest work concerning the origin of cancer. At the meeting of the American Surgical Association held in New York in June, 1937, Dr. John Morton read a paper on 'The Etiology of Cancer in the Light of our Present Knowledge,'** and it occurred to me that if I could act as a reviewer of this article and present some of the most startling developments it would help to elucidate many of our didactic clinical concepts of prophylaxis.

"Dr. Morton says: 'Knowledge regarding the causes of cancer came to us from several sources. The human family furnished examples of cancer in its natural origins. It gave us evidence of the influence of constitution, race and environment. The potency of environmental factors was shown when man produced human cancer, unwittingly to be sure, but effectively, in many of his occupations. Naturally occurring cancers in many species of the animal kingdom added for controlled observations. Hereditary influences could be more easily recorded in selected animal strains of known constitution. And finally when cancer could be more easily recorded in selected animal strains of known constitution. And finally when cancer could be produced at will in various species of laboratory animals, a method was provided to test the cancer promoting powers of many different substances.

" 'The attempt to glean from the literature the salient facts regarding the cause of cancer is a task which is well nigh impossible for any one individual. It presupposes that such an individual be conversant with such diverse subjects as heredity, biology, chemistry, pathology, metabolism, radiant energy, vitamins, viruses, enzymes and the internal secretions of the ductless glands. The limitations imposed by such a formidable array accordingly must be taken into account. In addition to this, the possibility that one single agency should furnish the cause for the many diverse types of cancer is remote. However, the ultimate intracellular change promoted by the varied cellular incitants may well be the same type of reaction.

" **'Inciting Factors.** The cancerous change in the cell may be initiated by many different forms of inciting factors. It is possible to classify these agents under three main groups:

1. Physical
   a. Traumatic
   b. Thermic—cold, heat
   c. Actinic—ultra violet, roentgen rays, radium
2. Chemical
   a. Stasis
   b. Simple chemicals
   c. Coal tars
   d. Internal secretions—estrogens, vitamins
3. Biologic
   a. Bacteria
   b. Viruses
   c. Helminths'

"Combinations of 1, 2 and 3 may also operate as inciting factors.

" 'The evidence that these inciting factors may operate in the production of malignancy has been gathered (a) from human occupational cancers; and (b) from studies on the origin of cancers in the human in association with the presence of these physical, chemical or biologic agents; (for example, the well known Kangri cancer of the skin of abdominal wall and inner side of the thighs resulting from burns received in squatting over the basket braziers; the betel nut cancer of the cheek in the Far East; the liver cancers associated with fluke infestations; the jagged tooth, syphilis and cancers of the mouth; the cancers arising in scars and ulcers; the effect of sunlight on the skin; the arsenic cancers; the role played by helminths in human tumors; the endocrine factor in breast cancer; and the estimation of how much weight should be given to single traumas); and (c) from the experimental laboratories of the world where cancers have been produced in various species of animals by diverse carcinogenic agents.'

"Since 1916 great advances have been made in the experimental production of cancer. Dr. Morton says: 'To select a few of these will serve to emphasize this side of the problem. Leitch placed human gallstones in the gallbladders of guinea pigs and cancer resulted after sufficient time had elapsed. Bagg caused carcinoma to follow stagnation of the breast secretions by repeatedly breeding without allowing the mice to suckle their young. This result was also brought about by ligation of the nipples. Berenblum by successive short applications of carbon dioxide snow to the skin of mice had carcinomata develop at the site of injury. . . . Biltris placed small amounts of radium element in collodion sacs in the liver or kidney of guinea pigs with resulting sarcomata of the kidney, carcinomata of the bile passages, and malignant unidentified tumors of the spleen. The malignancy of these growths was evidenced by wide metastasis. Bullock and Curtis produced sarcoma in the liver of rats by feeding them the eggs of the cat tapeworm. The malignant tumors developed in the fibrous tissue of the cyst walls, the rat serving as the intermediate host. These sarcomata proved to be very malignant and transmissible by inocculation. This furnished research laboratories with an excellent experimental material. . . .'

" 'There has been a great revival of interest in the etiologic factors due to the brilliant researches upon the chemistry of the coal tars.'

"Numerous workers have shown that coal tars are productive of cancer. And while many have gradually broken up the substances of coal tar which are carcinogenic, it was not until Hieger, who had previously noticed a resemblance between the fluorescent spectrum of benzanthracene and that of one of its carcinogenic fractions of coal tar, found that if 1:2:5:6 dibenzanthracene was painted on the skin in a benzene solution cancers were produced in mice. He found that 'A subcutaneous injection of the same substance in lard caused sarcomata in mice and rats. The fluorescence spectra of active carcinogenic tar fractions showed bands at wavelengths 4,000, 4,180 and 4,400 angstroms. By tracing the appearance of these bands in successive

fractional distillations and testing the carcinogenic potencies, Cook, Hewett and Hieger were able to identify and isolate 1:2 benzpyrene from the coal tar. The numbering has been changed to 3:4 benzpyrene to conform to older usage in the literature. This is the only potent carcinogenic compound which has been shown to be present in coal tar.

" 'Even more striking has been the production of mammary carcinoma in mice by continued stimulation of these glands by a normal hormone. Leo Loeb for years has furnished evidence of the effect of the ovaries on mammary cancers in mice. These experiments proved that the presence or the absence of the ovary determined the frequency of mammary cancer and the age at which it appeared. Malignancy was further conditioned by hereditary factors. Lacassagne injected massive daily doses of estrone benzoate in mice. He thus kept the mammary glands under continuous stimulation by a physiologic agent. He was able to show a progressive change of the breast through various stages to malignancy. This result could also be brought about in male mice of a strain in which the females showed a high natural incidence of breast cancer. . . . When estrin has been applied to the skin of mice for long periods, the effects were not on the local skin but on the tissues connected with the genital structure—breast, vagina, uterus in females, prostate in males. A comparative study of other estrogenic hormones was also carried out by Lacassagne, who demonstrated characteristic tissue changes in the mammary glands, uterus, prostate and hypophysis. Each hormone showed some effects which differed from those provoked by the others. The close similarity in chemical structure between the carcinogenic hydrocarbons and the estrogenic substances received also a proof of similar physiologic action when it was found that some of these hydrocarbons could produce estrus.

" 'Some recent experimental work upon vitamin factors has been of extreme interest. Adamstone destroyed vitamin E in the diet fed to developing chickens. There resulted lymphoblastomata involving the heart, lungs, liver, spleen, pancreas and gizzard in a large proportion of the experimental animals. In contrast to this Rowntree, et al., administered vitamin E to white rats in the form of an ether-extracted crude wheat germ oil. After 1 cc. had been given in the food daily for 116 days spindle cell sarcomata of the abdominal cavity were found. These could be transplanted to other animals. The neoplasms grew rapidly and caused death. Repetition of this work by Dorrance and Ciccone showed tumors in 100 per cent, transplantable in 100 per cent. Other oils and purified wheat germ oil gave negative results.

" 'Recently interest has been aroused again by the discoveries of cell free transmissible papillomata and fibromata in rabbits. Rous and Beard experimented with the Shope rabbit papilloma virus. It was found that in the course of a few months many of these virus-induced papillomata became malignant squamous cell carcinomata. The virus could not be recovered from the cancers but evidence of its presence was obtained indirectly by serologic tests. When the virus was injected into the blood stream of rabbits with tarred ears, it localized and caused both papillomata and cancers to develop at once.' "

(To be continued in next issue).

COMMUNICABLE DISEASES REPORTED

Urban and Rural - February 26 to March 25, 1940

Measles: Total 2,810—Winnipeg 2,332, Flin Flon 76, Bifrost 55, Kildonan West 42, St. Vital 32, St. James 21, Kildonan East 19, Saskatchewan 18, Tuxedo 18, St. Boniface 15, Harrison 14, Brooklands 10, Fort Garry 9, Springfield 9, Lorne 7, Morris Town 4, Unorganized 3, St. Paul West 2, Oakland 2, Roland 2, Ste. Anne 2, Rockwood 1, St. Andrews 1, Transcona 1, Brandon 1, Eriksdale 1, Lansdowne 1, St. Paul West 2 (Late Reported: Grey 49, Flin Flon 47 North Norfolk 8, Roland 3, Tuxedo 1, Selkirk 1 Teulon Village 1).

Whooping Cough: Total 184—Winnipeg 75, St. Boniface 35, Unorganized 9, North Norfolk 8, Portage City 8, Rapid City 6, Hanover 4, Brooklands 3 Saskatchewan 3, Brandon 2, St. James 2, Transcona 2, Kildonan East 1, Lawrence 1, Louise 1 (Late Reported: Rapid City 10, Brandon 7, North Norfolk 2, Portage City 2, Riverside 1, Unorganized 1 Glenwood 1).

Chickenpox: Total 166—Winnipeg 51, St. Boniface 2 Unorganized 15, Rivers 14, Brandon 13, Transcona Tuxedo 5, Daly 5, Rosedale 3, Clanwilliam 2, Portage Rural 2, Blanshard 1, Ethelbert 1, Grandview Rural 1, Hamiota Rural 1, Hamiota Village 1, Kildonan East 1, Minnedosa 1, Morton 1, St. James 1, Ste Rose Rural 1, The Pas 1 (Late Reported: Portage Rural 4, Unorganized 3, Brandon 2, Woodlands 2 Lawrence 1).

Mumps: Total 70—Winnipeg 46, Unorganized 14 Kildonan East 4, MacDonald 2, St. Boniface 2 Hamiota Rural 1, Kildonan West 1.

Tuberculosis: Total 45—Winnipeg 12, Unorganized 8 Selkirk 3, St. Boniface 2, Brandon 1, Brenda 1 Brokenhead 1, Cartier 1, Grey 1, Hanover 1, Kildonan East 1, Kildonan West 1, Minitonas 1, Montcalm 1 Neepawa 1, Portage Rural 1, Russell Town 1, Ste Anne 1, St. Laurent 1, Ste. Rose du Lac Village 1 Ste. Rose Rural 1, St. Vital 1, Whitemouth 1 (Late Reported: Victoria Beach 1).

Scarlet Fever: Total 42—Winnipeg 19, Unorganized 8 Tuxedo 3, St. Boniface 2, Dauphin Town 1, Kildonan West 1, Minitonas 1, St. Andrews 1, St. Vital 1 Souris 1, Springfield 1, Stanley 1 (Late Reported Dauphin Town 1, Minitonas 1).

Typhoid Fever: Total 23—Ste. Anne 14, St. Boniface 5, Tache 2, Eriksdale 1 (Late Reported: Ste. Anne 1)

Diphtheria: Total 20—Winnipeg 12, Portage Rural 1 Richot 1, St. Andrews 1, Selkirk 1 (Late Reported Portage Rural 3, St. Boniface 1).

Lobar Pneumonis: Total 18—Ste. Rose du Lac Village 3, Ste. Rose Rural 2, Hanover 1, Unorganized 1 (Late Reported: Hanover 3, Clanwilliam 1, Brandon 1 Cartier 1, Franklin 1, Lorne 1, Riverside 1, Strathcona 1, St. Boniface 1).

Influenza: Total 15—Winnipeg 3, Saskatchewan 2 Kildonan East 1, Rapid City 1, Whitemouth 1 (Late Reported: Brandon 1, Franklin 1, Morris Rural 1 Rossburn 1, Winchester 1, Unorganized 2).

Encephalitis: Total 8—(Late Reported: Selkirk 8).

Diphtheria Carriers: Total 6—Roblin Town 4, St Clements 1, Winnipeg 1.

Erysipelas: Total 4—Brandon 1, Hanover 1, St. Boniface 1, Winnipeg 1.

Septic Sore Throat: Total 2—Ethelbert 1, Tuxedo 1.

Anterior Poliomyelitis: Total 1—(Late Reported Rosedale 1).

Venereal Disease: Total 122—Gonorrhoea 85, Syphilis 37 (for month of March).

DEATHS FROM ALL CAUSES IN MANITOBA

For the Month of November, 1939

URBAN—Cancer 35, Tuberculosis 10, Pneumonia Lobar 9, Pneumonia (other forms) 6, Influenza 2 Syphilis 2, Whooping Cough 2, Lethargic Encephalitis 1, Measles 1, all others under one year 9, all other causes 181, Stillbirths 18. Total 276.

RURAL—Cancer 23, Pneumonia (other forms) 17, Tuberculosis 13, Influenza 10, Pneumonia Lobar 9, Syphilis 2, Whooping Cough 2, all others under one year 27, all other causes 160, Stillbirths 16. Total 279.

INDIAN—Tuberculosis 9, Pneumonia (other forms) 2, Influenza 1, all others under one year 3, all other causes 9, Stillbirths 1. Total 25.

NOTICE RE CANCER HANDBOOK

On Page 79 of the April issue of the "Review," a notice was published stating that the Canadian Medical Association would be glad to mail a copy of a handbook on cancer. This notice was inserted in error. A second edition of the handbook has not been considered by the committee.

NAVITOL MALT COMPOUND

Navitol Malt Compound (Squibb Syrup of Vitamins with Liver Extract and Dicalcium Phosphate) is a palatable syrup which combines refined fish liver oils, malted wheat germ extract, dicalcium phosphate, liver extract and pure food flavor. It supplies Vitamins A, B, D and G in natural form, together with calcium and phosphorus and the nutritional factors present in liver extract and wheat germ. It is biologically assayed for vitamin potency.

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